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ABSTRACT

Developed to provide an alternative system for identifying emotional disturbance in students, the manual begins by briefly reviewing problems in current identification approaches. An emotionally disturbed person is defined in the paper as someone who exhibits either too much or too little of a socially significant behavior. An approach is then described to quantify frequency of these behaviors and to compare these to frequencies of the same behavior in a reference group. Information is given on criteria for selecting an observation strategy (based on such questions as where, what and when to observe). Five ways in which data can be observed and reported in a graphical format are considered: frequency/time interval, rate, elapsed time, interval, and percentage. Possibilities for processing the observational data are suggested. The bulk of the paper is composed of appendixes listing observation strategies for commonly referred and observed behaviors (such as incomplete or unacceptable classwork or homework, crying, out-of-seat behavior and physical or verbal aggression); a sample tabulation form; examples of data recording; a summary of other techniques for interpreting behavioral data; and information on devleloping local norms. (CL)

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QUANTIFYING EMOTIONAL DISTURBANCE

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QUANTIFYING EMOTIONAL DISTURBANCE

INTRODUCTION

How do we determine that a student is emotionally disturbed? In most school districts the "expert" system is used. A team of "experts" conducts observations, performs tests, and interviews the child, parents, and school staff. Usually a pseudo medical model is implicit and the primary data are the opinions of school staff. These opinions are then validated with the test data and the observations of the "experts."

Many in the field who are aware of the lack of reliability and validity of the instruments used by these "experts," the subjectivity of the opinions of school personnel, and the futility of the medical model have tried to either circumvent this process or avoid being involved. These materials were developed to provide an alternative to those who reject the traditional approach. Consequently, there will be no literature reviews in support of the above criticisms of the traditional approach for these materials are written for those who have read the literature and wish to change the system to a more rational and objective approach.

WHAT IS EMOTIONAL DISTURBANCE?

A woefully, confusing, simplistic, and inaccurate term provided by the mental health establishment is probably the best definition. However, not practically or scientifically very satisfying. For the purpose of this paper, emotionally disturbed will be defined as someone who exhibits either too much or too little of a socially significant behavior. Too much or too little is to be defined in statistically significant terms or at least in terms relative to a comparison group.

HOW DO WE DETERMINE EMOTIONAL DISTURBANCE?

As suggested above, and by the title of this paper, we will use numbers. These numbers will be related to the frequency of the behavior in question. We will then compare these frequencies to the frequencies of this same behavior in a reference group. We must use this approach because inappropriate behavior can only be defined in relationship to appropriate behavior within a specific social group. To use an extreme example, cannibalism is "normal" for tribes in Borneo, but would be frowned on or considered "deviant" in much of Peoria.

There are, of course, a number of reference groups we might use. We could use a national, state, school district, school, or single classroom reference group. These groups could be further subdivided into significant subcategories such as sex, socioeconomic status, classroom structure, intelligence, etc. It would be ideal to have this sort of information, and someday it may be available, but the field practitioner needs something right now and that is the purpose of this paper.

As indicated above, we are interested in the frequencies of selected behaviors. To obtain this information it is usually necessary that classroom observations be made. Two questions immediately arise. Which behaviors should be observed and how should they be tabulated? The first question is easily answered. Observe and tabulate those behaviors which the referral agents indicate cause the most concern. The second question is partially answered in

Appendix A, in which 15 common student behavior problems are described in detail with a sample observational strategy provided for each. Although these problems were selected by the author based upon both a literature search and his experience, it is quite possible that other problems not listed may be identified. The observational and recording strategies provided in Appendices A, B, and C should enable the reader to develop his/her own strategy for these behaviors.

In selecting an observation strategy several elements must be identified:

(1) Who is to do the observing? In some cases the teacher is most appropriate. If possible, a teacher aide who has been trained should do all of the observations. The observation strategy should be evaluated for feasibility prior to the actual data collection by the behavior consultant through one or two preliminary observations. These observations will also enable the consultant to verify the severity of the student's problems.

(2) Who is to be observed? This is the critical element in the observation strategy. Obviously, we observe and collect data on the referred student. In addition, a control student of the same sex in that same classroom should be observed. A different control student should be selected for each observation time block. Both the control and the referred student should be observed at the same time if at all possible. Data must be tabulated in exactly the same way for both students as this data will be the basis of several very important decisions which will be discussed shortly.

(3) What is to be observed? Usually two or three behaviors will be observed, if possible, simultaneously. The actual count can be recorded using a form such as found in Appendix B. Recording the time start and time stop as well as frequency enables us to use either frequency/interval or rate for recording our observational data.

(4) Where to observe? Wherever the target behavior occurs to the detriment of the referred student or to the class as a whole. Usually in the classroom, lunchroom, or on the playground.

(5) When to observe? Observation time blocks should be no shorter than 10 minutes. The maximum length is usually one day, but could be longer for low frequency but serious problem behaviors. Generally, at least five instances of the behavior should occur in an observation time block. It is also important to always observe in a consistent environment in which the same general type of

activity is happening. Observe always during seatwork or always during free time, since the frequency of many behaviors is influenced by the ongoing classroom activity. As a general rule no fewer than five distinct observations should be made on five different days; however, seven observations are preferable and even more may be needed for low frequency behaviors (fewer than five per block). It is helpful to remember that for low frequency behaviors the time block might be a day, a week, or even two weeks. If a behavior occurs at a lower frequency than five times in two weeks than a related behavior which occurs more frequently, should be counted. For example, verbal aggression usually precedes physical attacks, but physical attacks don't always follow verbal aggression. Counting and ultimately eliminating verbal aggression is also likely to reduce fighting behavior.

HOW TO RECORD THE DATA

Most observational data are initially collected in a frequency format. In some instances the frequency data are transformed prior to actual recording. Following are five ways in which data can be observed and reported in a graphical format. Examples of plotting of each of these will be found in Appendix C.

(1) Frequency/Time Interval - Always observe for exactly the same length of time and simply record the frequency for each observation session.

(2) Rate - Record both the frequency of the behavior and the number of minutes in each individual observation. Divide the total frequency of the behavior by the total number of minutes observed. Record the resulting rate for each observation session, e.g., six behaviors in twelve minutes = .5 behaviors per minute.

(3) Elapsed Time - Use for behaviors which go on over a period of time such as thumbsucking or rocking. Record the number of minutes observed and, using a stopwatch, record the amount of time the subject engages in the behavior by running the watch when it occurs and stopping the watch when it does not. Divide the number of minutes the behavior occurred by the total number of minutes in the observation session, multiply by 100 and record this percentage of occurrence of the behavior. If a uniform time block can be used, plot total minutes the behavior occurs.

(4) Interval - For highly frequent or ongoing behaviors observe the student for a set time interval such as every 60 seconds and record his/her behavior for 20 or more observations. Record + if the behavior is occurring at the instant you look at the student and 0 if it is not. Total the +'s and 0's and divide this

total into the total +'s and multiply by 100. This yields the percentage of occurrences of the behavior for each observation session, e.g., 15 +'s, 5 0's = 20, 15 ÷ 20 x 100 = 75%. Record this percentage for each observation session.

(5) Percentage - Use for assignments completed or similar unpredictably variable data. Divide the number obtained by the total possible and multiply by 100, e.g., 7 assignments given in a day, 3 completed acceptably = 43% completion rate which is to be recorded.

PROCESSING THE OBSERVATIONAL DATA

The data obtained as described above must be processed and evaluated. There are a number of possibilities available for using these data once they have been processed. Some of these will be suggested below.

First, the data on the referred subject and the control subjects should be plotted in graphical form for ease of comparison, especially for those who have problems interpreting numerical data. Use of a bar graph, showing the referred student and the control student side by side in different colors, is quite effective. See Appendix C for samples.

Next, a mean should be calculated for both the experimental and control student(s) data on each observed behavior. When recording procedures 1 - 5 above are used, it may be necessary to go back to the original frequencies to compute these means. Using only the control student's data a standard deviation is then estimated. See Appendix D for computational details. The referred student's mean score is then compared to the distribution of the control student's scores and a determination is made as to whether or not his/her score is significantly different from the control scores. As a general rule, a minimum difference of 2 standard deviations is an undesirable direction would be considered significant. However, because the number of observations is small, potentially restricting the variance, common sense and a conservative attitude should prevail. In other words, numbers aside, this student should <u>stand out</u> from his/her peers. Of course, the more observations which are made the more reliable will be the data.

Two extremely significant extensions of this approach should also be apparent. First, it provides an objective, behavioral, and quantitative basis for not only placement but "cure." When a student's behavior approaches plus or minus one standard deviation of the mean of that behavior for control students he is cured

of his "emotional disturbance." The behavioral objectives for the emotionally disturbed student can then be stated in relationship to the distribution found for the control students. For example, the behavior will occur at a frequency within plus or minus one standard deviation of the mean frequency of the control students. Plus or minus one standard deviation is often considered the average range.

Secondly, over a period of time it would be relatively easy to develop a set of local norms for many behaviors. Of course, as the number of control observations accumulates, the more reliable become these local norms.

A farsighted school district might even train aides to collect control data across the district and establish local norms. A State Department of Education could even develop statewide norms if it so desired. See Appendix F.

While we are awaiting the bureaucracy, however, it would seem wise to individually begin to move toward a more objective approach as outlined above, both for the sake of our students and for our own professional sense of self-respect.

Unfortunately, the use of the standard deviation as an index of the severity of the problem is inappropriate for some types of behavioral data. This is true because the interpretation of the standard deviation is based upon a presumed normal distribution of the frequency of the behavior with no artificial restriction of the range of the frequencies or scores. For example, these behaviors marked with an asterick (*) on page 6 are inappropriate for computation of a standard deviation. For dealing with these and similar behaviors see Appendix E.

APPENDIX A

OBSERVATION STRATEGIES FOR SOME COMMONLY REFERRED AND OBSERVED BEHAVIORS

INTERNALIZING BEHAVIORS

* 1. Incomplete or unacceptable classwork/homework.
* 2. Inappropriate verbalizations with a bizarre or fantasy theme which is unrelated to present task and/or activity.
3. Initiating an appropriate conversation or interaction with peers, teachers, or others.
* 4. Stereotypic, repetitive, self-stimulating, or self-abusive behaviors.
5. Dependency behavior toward teacher - touching, following around, approaching.
* 6. Crying.

EXTERNALIZING BEHAVIORS

7. Inappropriate out of seat.
8. Inappropriate talkouts to teachers or peers (non-aggressive - see aggressive verbalizations).
9. Physical aggression - hitting others with hands or an object or throwing objects.
10. Verbal aggression - teasing, insults, negative comments about others, telling on others, swearing, arguing vehemently, laughing at others.
11. Property abuse or destruction - littering, spelling, writing on books, carving, breaking, etc.
12. Noise-making - using objects (foot-tapping or hitting objects) or by other than verbal means (humming, whistling, etc.).
*13. Refusal to comply with teacher requests.
14. Temper tantrums.
15. Dishonest behavior - stealing, cheating on tests, homework, copying off others, lying.

INCOMPLETE OR UNACCEPTABLE CLASSWORK OR HOMEWORK

Ask the classroom teacher to either use records or tally the number of written assignments, either classwork or homework, given in a day and the number of assignments complete and acceptable. Have the teacher record the following information:

1. Number of Male students who were expected to complete each assignment.
2. Number of Female students who were expected to complete each assignment.
3. Number of Male students whose assignment was either incomplete or unacceptable.
4. Number of Female students whose assignment was either incomplete or unacceptable.

Written assignments could be reports, math practice problems, workbook pages. Tests should not be considered assignments. Use percentage computed separately for boys and girls.

INAPPROPRIATE BIZARRE OR FANTASY VERBALIZATION

Types of verbal behavior to be counted include:

1. Fantastic tales which the student insists are true when questioned, e.g., "I went for a ride in a flying saucer." "God talks to me."
2. Talking to or responding to "voices" that the student hears.
3. Talking about something which is totally unrelated to the setting or activity in which the student is at the time.
4. Stating words or sentences which make no sense.
5. Talking to an imaginary friend or pet as if it were really present in the classroom.

Count each instance of the behavior by counting a word, phrase, or sentence which sounds as if it is a complete statement, question or response based on the inflection used by the student. Use frequency/time interval or rate.

INITIATING APPROPRIATE CONVERSATION

Count each instance in which the student speaks first to someone else and in which the content of the statement is appropriate. Appropriate content might include requests, questions, comments about something, relating an incident which has happened. Inappropriate content would include insults, nonsense state-

ments or name calling. Count only the initiation of the conversation, not subsequent conversation with that individual, unless there has been a break in the conversation of one or more minutes. This break must be timed. Use frequency/time interval or rate.

STEREOTYPIC, REPETITIVE, SELF-STIMULATING OR SELF-ABUSIVE BEHAVIOR

All behaviors described below or similar behaviors are to be observed in the following way.

Using a stopwatch observe the child at 3 minute intervals for one second each interval. Record + if the behavior is occurring and 0 if it is not occurring. Record 10 observations. Record the specific behavior which is being counted on the observation form as well.

Some of the typical behaviors which fall under this category might be:

1. Rocking, hand flapping or waving, foot tapping.
2. Repetition of a nonsense sound, word, or phrase.
3. Spinning objects, flipping pages, scribbling, pencil tapping, finger tapping.
4. Thumbsucking, nail biting, rubbing of any part of the body.
5. Biting self, banging head against objects, striking head, face or body with own hand or an object.

Use interval or elapsed time.

DEPENDENCY BEHAVIOR TOWARD TEACHER

Count each time the student touches the teacher with his/her hand or goes to the teacher without being requested to do so. The child must leave one place (seat, work station, another part of the room) and go to the teacher. The child need NOT speak upon reaching the teacher Use frequency/time interval or rate.

CRYING

Use a stopwatch and record the cumulative time that the child is crying for any reason. Crying includes not only overt tears, but sniffling and sobbing behaviors. Record by starting the stopwatch at the onset of crying behavior, stopping the watch when crying behavior ceases and starting the watch again each time the child resumes crying behavior. Record the total number of minutes and seconds that the child engages in crying behavior during the 30 minute time block. Use interval or elapsed time.

OUT-OF-SEAT

Observe during a seatwork or written assignment activity such as looking up and writing answers to study questions; completion of workbook pages; completion of a math assignment; etc.

Count as one behavior the complete movement from in-seat to out-of-seat and then return to in-seat. Use frequency/time interval or rate.

INAPPROPRIATE TALKOUTS

An inappropriate talkout is a word, phrase, or sentence which is any one of the following:

1. Unrelated to the ongoing activity in the classroom. For example, the class is discussing a math process and the student comments, "Yesterday, I went fishing."
2. Inappropriate in content (e.g., "Math is dumb." "I don't want to do this." "Ugh!").
3. Any conversation with another student when such conversation violates classroom rules or is not appropriate to the situation (e.g., Students are not expected to converse when working on daily work or a test, or a student makes a comment to or asks a question of another student.).
4. A student volunteers an answer without raising his/her hand when handraising is clearly expected by the teacher. A student interrupts the teacher when the teacher is explaining or giving directions, or interrupts another student.

Count each verbalization that expresses a thought or idea (e.g., "Teacher," "What page?" "Ugh!" "Tomorrow, I am going to the fair." "Me, me."). If you cannot hear the entire statement because the child is whispering, etc., watch lips or body movements (leaning forward) and count each time these movements start and count each time these movements start and stop as one talkout (e.g., The student leans forward to talk and then returns to former position, lip movements start and then stop for 2 or more seconds -- count, one thousand one, one thousand two slowly.). Use frequency time interval or rate.

PHYSICAL AGGRESSION

Count each time the child hits or attempts to hit another person with any object, any part of his/her own body, throws any object, or makes any type of physical contact with another person to which the other person responds with an expression of pain, or an attempt to terminate the contact. Use frequency/time interval or rate.

VERBAL AGGRESSION

1. Record a N for each complete negative thought expressed in teasing, insulting, and negative comments about others, e.g., "jerk," "baby," "You are chicken," "You are dumb," "You're nuts!," etc.
2. Record a L for each time the student laughs at another's mistakes, injury, or discomfort.
3. Record a T for each time the student tattles on another student.
4. Record a S for each swear word or profane word uttered by the student.
5. Record an A for each instance in which the student disagrees with another person using a louder than normal voice. Record one A for a specific argument with one person on one topic, regardless of how many words were said.
6. Record a D for each time the student defies an adult request verbally, e.g., "I won't do it," "You can't make me," "Go to hell."

One through six may also be combined under general verbal aggression. Use frequency/time interval or rate.

PROPERTY ABUSE/DESTRUCTION

Record each instance of behavior which may or does result in damage to any school or personal property. Count such behaviors as littering, spilling, writing in inappropriate places (books, walls, desks, etc.), carving, ripping, cutting, hitting, slamming, kicking of property, or pulling on or otherwise abusing clothing. Use frequency/time interval or rate.

NOISE-MAKING USING OBJECTS

Count each individual discrete unit of noise such as slamming a desk top or dropping a book. Count each ongoing behavior such as humming, whistling, or foot-tapping as a new instance of the behavior when the behavior stops for three seconds and then begins again. Count slowly, one thousand one and one thousand two and one thousand three. Use frequency/time interval, rate, or, if behavior is enduring interval or elapsed time.

REFUSAL TO COMPLY WITH TEACHER REQUESTS

Count each instance in which the student does not begin to comply with a teacher command or request within 10 seconds. Use a stopwatch or a clock with a second hand for timing. Typical requests might be "Sit down," "Get out your book," "Come here," "Be quiet," "Get to work." Do NOT count instances in which the student does

not respond to a subject matter request of command, e.g., "Read that sentence out loud," "Mary, tell me who was our first President?" Use percentage.

TEMPER TANTRUMS

Count each instance in which the student engages in a temper tantrum. A temper tantrum is a violent, verbal, and physical outburst which MUST include at least two of the following behaviors: crying, screaming, swearing, kicking or hitting the floor or any object or person, throwing objects or destroying objects, and must be for at least two minutes in duration when timed from onset to the point in time at which the student becomes quiet. Use frequency/time interval or rate.

DISHONEST BEHAVIOR

Count each instance in which the student takes property belonging to another and does not return it during the observation session, looks on another student's test, or borrows another student's classwork or homework and copies it. Record a S for stealing and a C for copying or cheating behavior. Record a L for any statement which is known by the student to be false. For example, denial of an act that he/she did commit. General dishonest behavior may be counted by combining S, C, and L. Use frequency/time interval or rate.

APPENDIX B

(Tabulation Form)

NAME: _____ SEX: _____

AGE: _____ RACE: _____

SCHOOL: _____ GRADE: _____

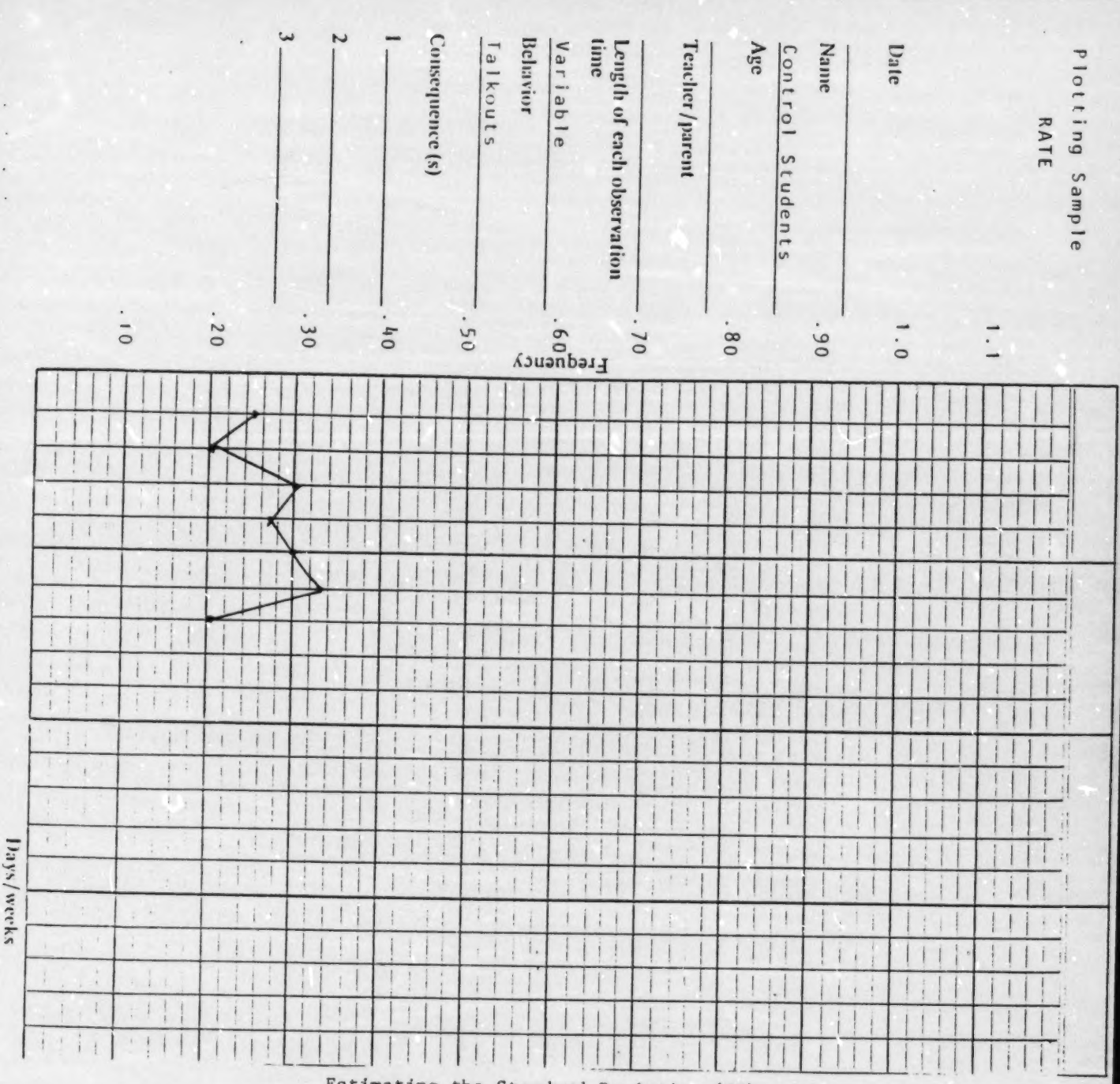
TEACHER: _____ OBSERVER: _____

DATE OF OBSERVATION: Month _____ Year _____

BEHAVIOR OBSERVED:

_____					
_____					
From	____to____	____to____	____to____	____to____	____to____
_____					
_____					
From	____to____	____to____	____to____	____to____	____to____
_____					
_____					
From	____to____	____to____	____to____	____to____	____to____
_____					
_____					
From	____to____	____to____	____to____	____to____	____to____

APPENDIX C



Estimating the Standard Deviation (SD)

Obtained frequencies and times, 5 in 20 minutes = .25, 7 in 35 minutes = .20, 15 in 50 minutes = .30, 4 in 15 minutes = .27, 9 in 30 minutes = .30, 5 in 15 minutes = .33, 12 in 50 minutes = .20; Mean = 1.85 ÷ 7 = .26: Median = .27; (n=7).

	X	X^2
	.25	.06
	.20	.04
	.30	.09
	.27	.07
	.30	.09
	.33	.11
	.20	.04
Total	1.85	.50

Mean = .26
Median = .27

$$SD = \sqrt{\frac{7(.50) - (1.85)^2}{7\ (7-1)}}$$

$$SD = \sqrt{\frac{3.5 - 3.42}{42}}$$

$$SD = \sqrt{.0019}$$

$$SD = .04$$

Plotting Sample

Elapsed Time - Plotted in Minutes of a Uniform Time Block

Date

Name

Control Students

Age

Length of each observation time

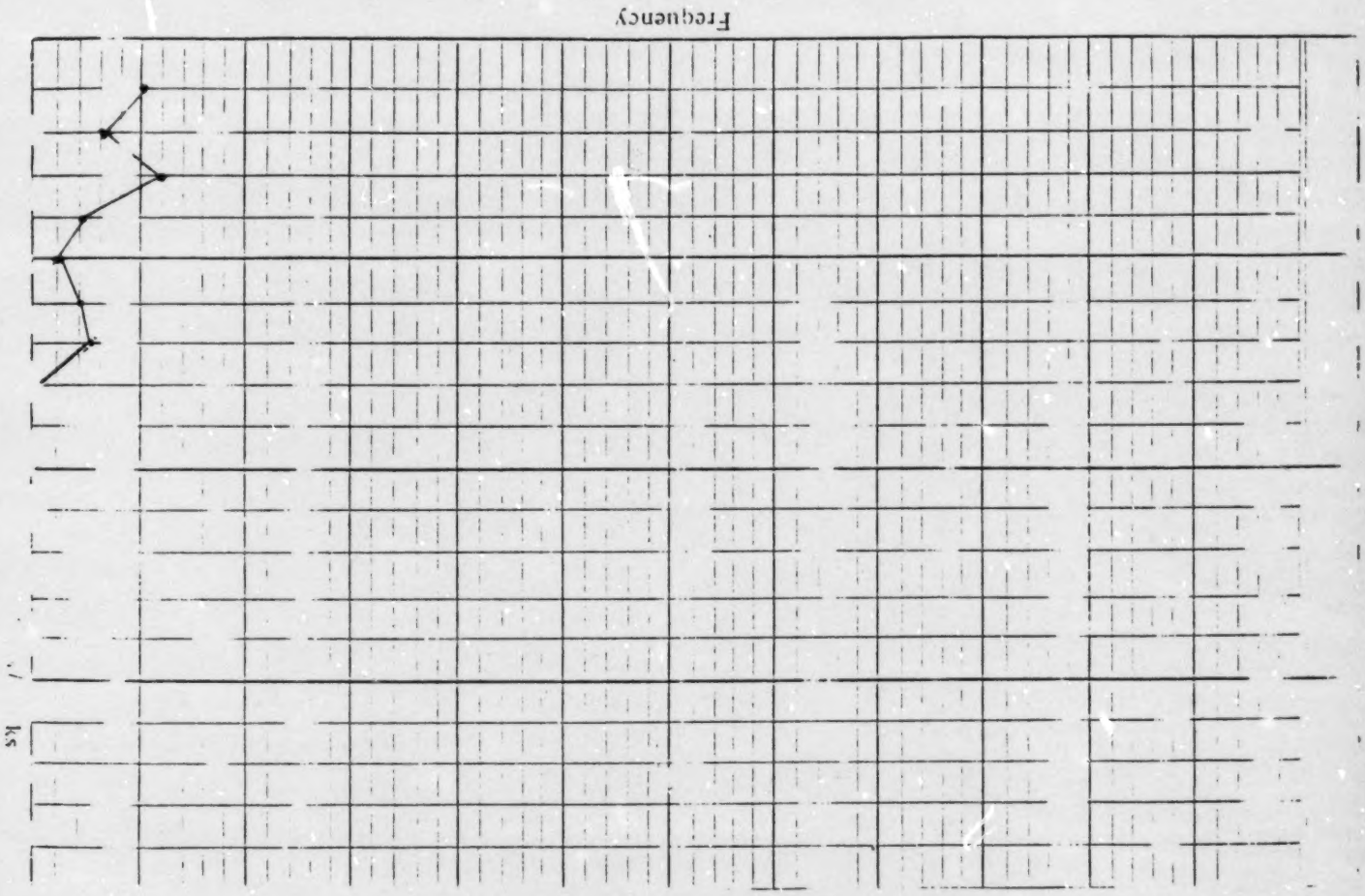
Elapsed Time

60 Minute Interval

Behavior

Rocking

Consequence(s)



Estimating the Standard Deviation (SD)

Obtained frequencies (minutes) 10,6,12,4,2,0,4,5; Mean= 43 ÷ 8 = 5.37, n=8

X	X^2
10	100
6	36
12	144
4	16
2	4
0	0
4	16
5	25
Total 43	341

Mean = 5.37

Median = 4.5

$$SD = \sqrt{\frac{8(341) - (43)^2}{8(8-1)}}$$

$$SD = \sqrt{\frac{2728 - 1849}{56}}$$

$$SD = \sqrt{15.69}$$

$$SD = 3.96$$

Plotting Sample Frequency Time Interval

Date _____

Name _____

Control Students _____

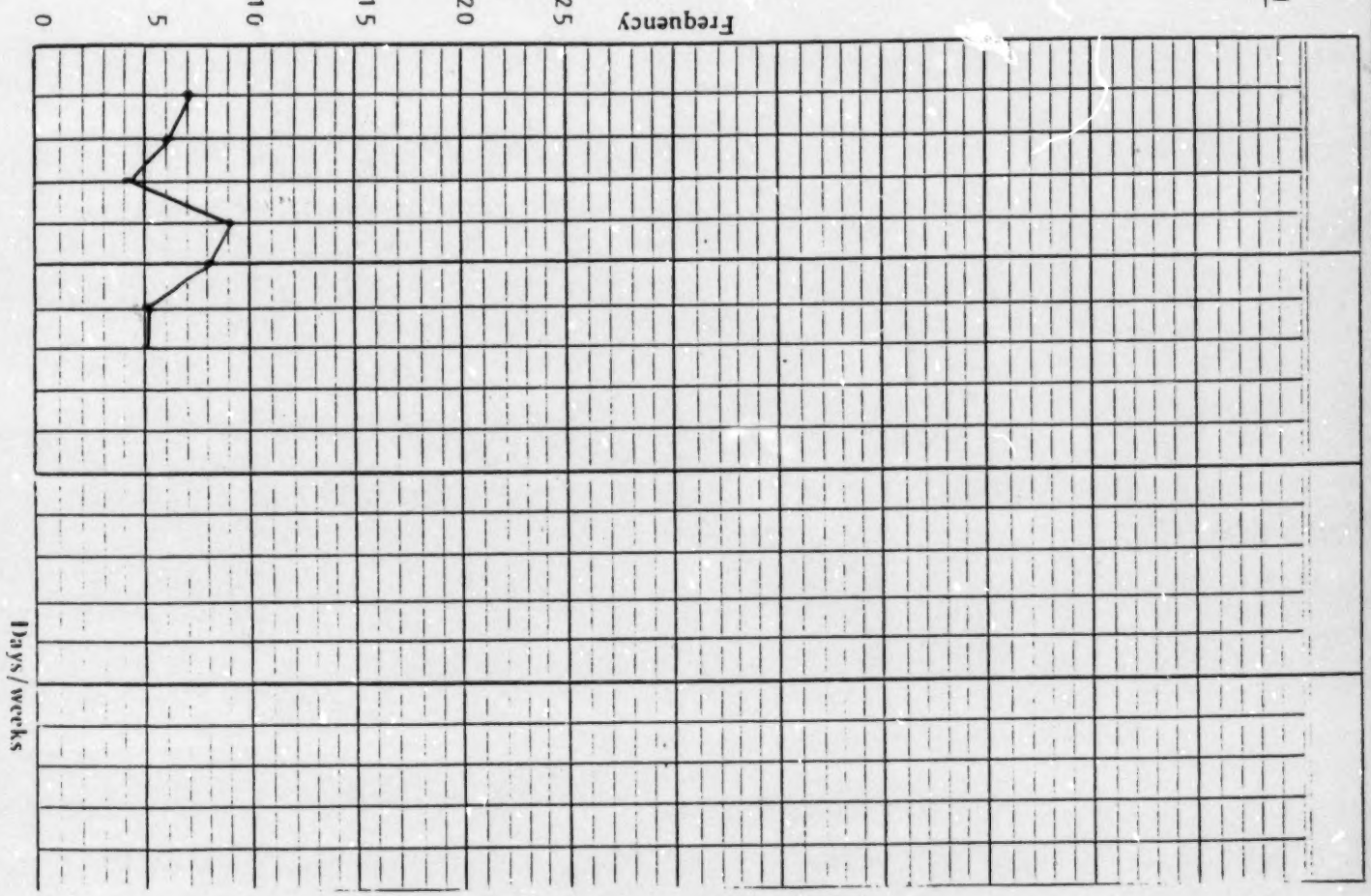
Age _____

Teacher/parent _____

Length of each observation time
40 Minutes

Behavior
Talkouts

Consequence(s)
1 _____
2 _____
3 _____



Estimating the Standard Deviation (SD)

Obtained frequencies 7, 6, 4, 9, 8, 5, 5; Mean = 44 ÷ 7 = 6.29; Median = 6.0; (n=7)

	X	X^2
	7	49
	6	36
	4	16
	9	81
	8	64
	5	25
	5	25
Total	44	296

Mean = 44
Median = 6.0

$$SD = \sqrt{\frac{7\,(296) - (44)^2}{7\,(7-1)}}$$

$$SD = \sqrt{\frac{2072 - 1936}{42}}$$

$$SD = \sqrt{3.24}$$

$$SD = 1.8$$

Plotting Sample

Interval

Date

Name

Control Students

Age

Teacher/parent

Length of each observation time

Interval - percent of occurrence

Behavior

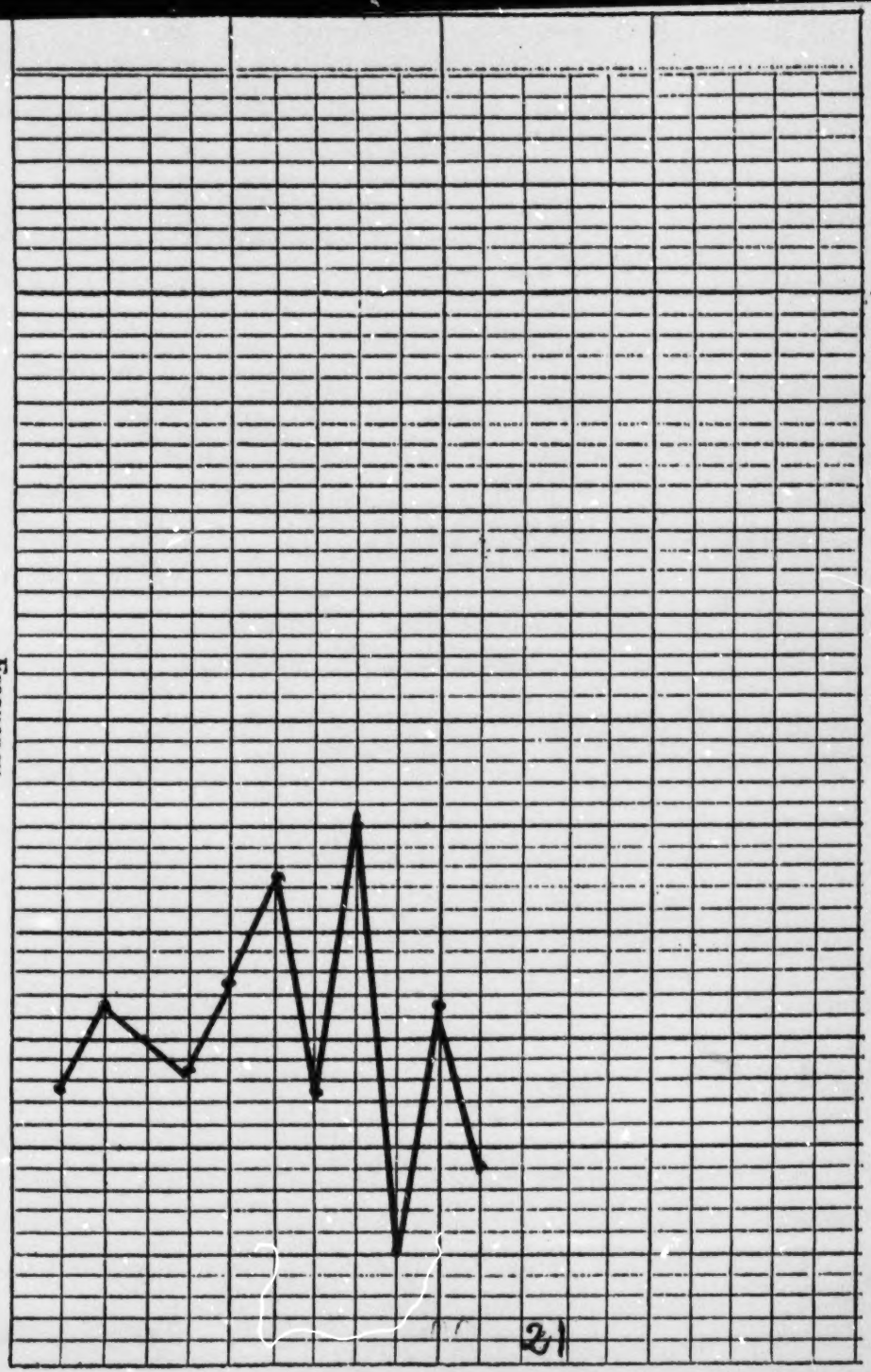
Out of Seat

Consequence (s)

1

2

3



Plotting Sample

Percentage

Date

Name

Control Students

Age

Teacher/parent

Length of each observation time

One Day

Behavior

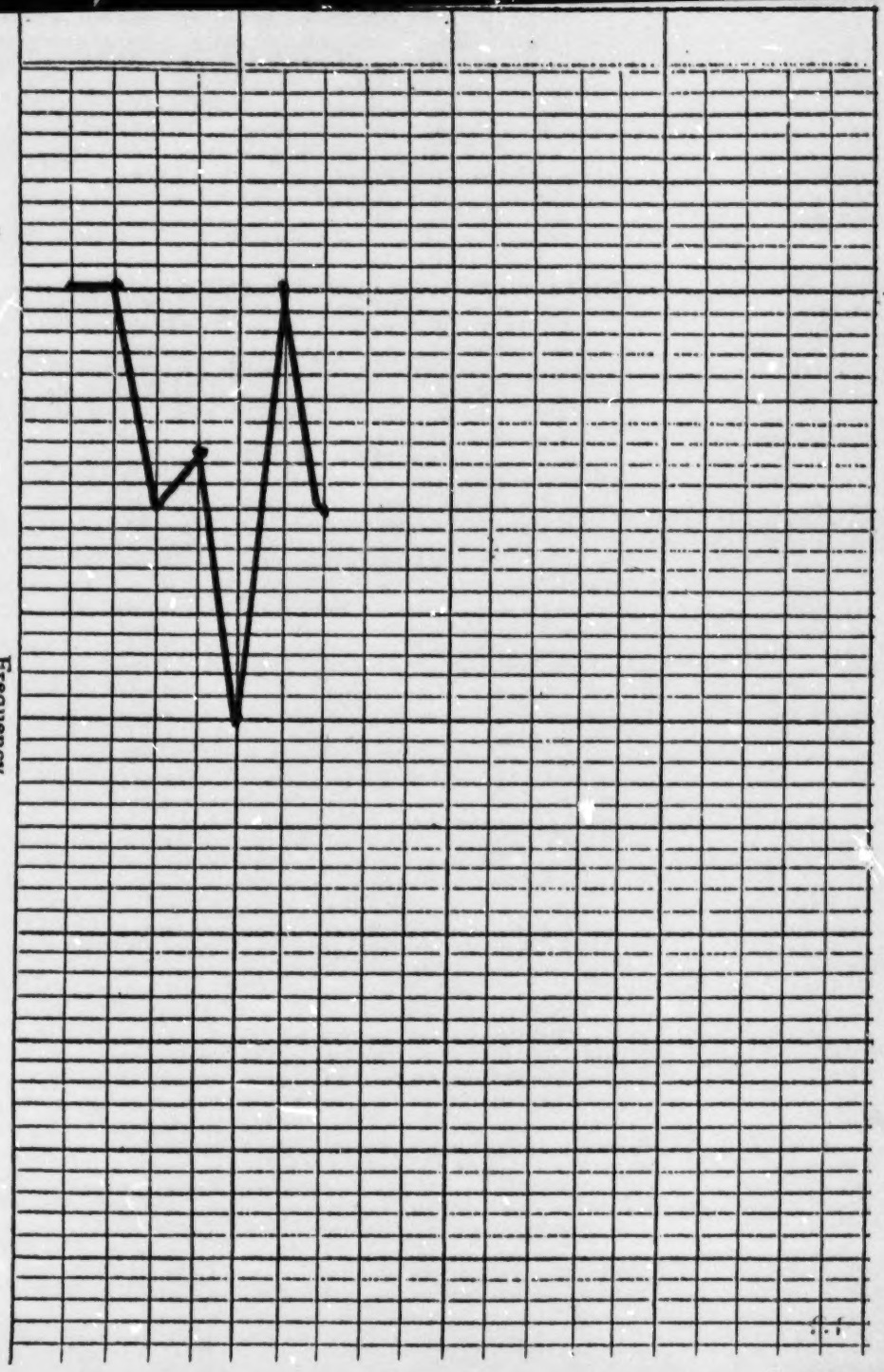
Assignments Complete

Consequence (s)

1

2

3



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APPENDIX D

ESTIMATING THE STANDARD DEVIATION (SD)*

An estimate of the standard deviation of a set of scores can be obtained through the following formula:

$$SD = \sqrt{\frac{n(\Sigma x^2) - (\Sigma x)^2}{n(n-1)}}$$

For example, we have obtained the following frequencies of talkouts for our control group in a classroom. Each observation being a different boy, and all observations are for 40 minutes. Frequencies = 7, 6, 4, 9, 8, 5, 5; Total = 44; Mean = 6.28.

A table of square roots and any calculator are all that are required. A table of square roots can be found in most statistics books. Many calculators will even calculate square roots, so a table of square roots may not be needed.

To compute the standard deviations using the above formula, it is useful to lay out the data in tabular form as is shown below:

Scores or Frequencies X	X^2
7	49
6	36
4	16
9	81
8	64
5	25
5	25
Total 44	296

Mean = 6.28
n = 7

$$SD = \sqrt{\frac{7(296) - (44)^2}{7(7-1)}}$$

$$SD = \sqrt{\frac{2072 - 1936}{42}} = \frac{136}{42} = 3.238$$

$$SD = \sqrt{3.24} = 1.8$$

Our standard deviation for our control group frequencies is then 1.8.

Using our rule of thumb that a score must be at least 2 standard deviations from the mean in the undesired direction, we then would interpret the above to require our subject's score to have a mean number of talkouts of at least 9.88 (6.28 + 1.80 + 1.80) to be significantly higher than the average student.

If the undesired direction were lower than our subject's mean score, it would have to be below 2.68 (6.28 - 3.6).

If our subject's scores contain one or two scores that are significantly higher or lower than the other scores, we should use the median score in place of his mean score. The median score is the middle score and is obtained by eliminating high and low scores until only one or two scores are left. The single score is the median; or if two scores remain, the average of these is the median score. For example, in this case, the control median is 6.0. Scores are 9, 8, 7, 6, 5, 5, 4. Eliminating 9, 8, 7 (high) and 5, 5, 4 (low) leaves 6 as the median. If we had scores of 9, 8, 7, 7, 6, 5, 5, 4, we eliminate 9, 8, 7 (high) and 5, 5, 4 (low) and average 7 and 6 which yields a median of 6.5.

It must be emphasized that with only seven scores, we are dealing with very unreliable figures. However, for a common behavior such as talkouts it would be rather easy to accumulate a good-sized number of observations, calculate a standard deviation, using this formula, and feel confident of our score's reliability. Once a reasonable number of control observations have been made - say 30 or more individual observations - we would have the basis of a local norm for talkouts, which can be applied as described above. Once local norms are available, we would only have to compute the mean of our referred student's behavior and compare the mean of the norm group scores, asking is it 2 or more standard deviations from that mean.

It should also be remembered that although the above estimate of the standard deviation and its interpretation must be done with caution, it is still a more valid process than the "expert" system usually used. However, once norms are established, this approach is vastly superior to the "expert system."

Finally, not only should the numerical data described above be presented, but graphical data for both the subject and control students should be prepared and presented for those who cannot or will not comprehend the numerical data. Appendix C contains sample graphs, and additional sample computations of the standard deviation accompany some of these graphs.

* NOTE: For those who have forgotten what they were taught in "Introduction to Measurement," sixty-eight percent of the population falls within plus or minus one standard deviation (average range) of the mean on any trait, while ninety-six percent fall within plus or minus two standard deviations. Thus, a score at minus two standard deviations is lower than ninety-eight percent of the population, and a score of plus two standard deviations exceeds the score of ninety-eight percent of the population.

We then can look at an individual's mean (average) score and compare it with the mean score of the control group observations. If the mean score of the individual exceeds or is exceeded by ninety-eight percent of the population (control mean, plus or minus two standard deviations), we would interpret it as a significant difference.

APPENDIX E

OTHER TECHNIQUES FOR INTERPRETING BEHAVIORAL DATA

Some data cannot be processed and interpreted in terms of the standard deviation for several reasons. There may be an artificial limit to the distribution. For example, assignments completed cannot exceed 100%; thus, putting a ceiling on the upper end of the distribution. Refusal to comply with teacher requests and assignments completed also would not have a normal distribution, since nearly all children complete their assignments and comply with teacher requests. Fantasy, verbalizations, crying, and self-stimulating behaviors are of such low frequency in the population that computation of a standard deviation would also be inappropriate due to the non-normal distribution.

Comparative data can be used in evaluating the severity of a student's problem in each of these cases, but the interpretation must be somewhat more subjective. Following are examples of how these kinds of data might be interpreted.

ASSIGNMENTS COMPLETED

Ask the teacher to calculate the percentage of assignments completed over several days by all students who received a grade of C or above at the last card marking. (Divide the total number of assignments completed for this group by the total numbers of assignments given.) Compute the percentage of assignments completed by the subject for one week and compare. If the subject's percentage is lower, then he/she probably has a serious problem.

COMPLYING WITH TEACHER REQUESTS

This can be handled similarly, but data could be collected on a few different "average" students for 10 days or so. If the subject's percentage of refusals is twice that of the control students, it might be assumed he/she has a significant problem (total non-compliances divided by total number of requests).

FANTASY, VERBALIZATIONS, CRYING, AND SELF-STIMULATING BEHAVIORS

All occur very infrequently in the normal population. A rule of thumb for determining if the subject's behavior is significant might be that the subject must engage in the behavior at five times the duration, frequency, or rate as the average of five control students observed for 10 observation blocks.

It is very important that graphical data be prepared on both subject and control students for visual comparison purposes for the above types of data so that significance may be more readily "seen."

It would, of course, be possible over a period of time to develop local comparative data or norms by accumulating the observational data of control students. If data were collected on 100 students, we could then compare and say our subject's rate, frequency, or duration of that behavior exceeds that of, for example, 95 of 100 students or 95% of the control groups. We would then have an objective and data based rationale for our decisions.

APPENDIX F - DEVELOPING LOCAL NORMS

Local norms have certain advantages. First, they reflect any local variation in acceptability of certain behavior. Secondly, they reduce the likelihood of determining eligibility as a result of racial, cultural, economic, or ethnic biases. All students are compared with their peers - not some middle class mid-western mythical average.

Several steps must be taken to develop local norms. These will be outlined in the following paragraphs:

1. All observational data collected for control group uses must be collected in the same manner. The timing must be very accurate. Trained and supervised observers should be used if at all possible--teacher aides or college students are good possibilities.

2. All data, once collected, should be sent to a person designated as responsible for the project by the school district. That person is responsible for all data collection and processing.

3. Data should be recorded and submitted on a daily basis. Generally, the frequency data should be transformed into a daily rate for processing purposes or all observational time blocks must be mathematically made equal which is a great deal of extra effort. A uniform observation plan with a standard time block must be used for behaviors which are observed on a cumulative time basis such as crying (6), stereotypic (4). For example, 60 minutes or low rate behaviors such as inappropriate verbalizations (2) or physical aggression (9) might be recorded for a full day. Behaviors recorded on a percentage basis such as assignment completion (1) and compliance (13) also cannot be handled on a rate basis. A questionnaire could be given to a sample of teachers at each grade level asking them to use their record books and report assignment completion in terms of subject area and sex. Compliance can be observed as suggested earlier, but the data cannot be transformed into rate.

4. The services of a person with training in statistics should be obtained for consultation regarding the design, statistical procedures and data processing. In most large school districts, someone with these skills is likely to be available on staff. A microcomputer could be used to process the data.

5. All data should be processed on the basis of individual daily observations for computation of the mean and standard deviation. An initial goal of 50 daily observations of 30 minutes each for each behavior seems reasonable. Usually a trained observer should be able to observe two students at the same time. Since data should be collected separately for each grade level and by sex, observational requirements would be:

Estimate of Observation - Time Required for Local Norms

A. Grades K-6 = 7 grades

B. Fifty 30 minute observations - two at a time (one boy and one girl) = 1,500 minutes for each behavior at each grade.

C. 7 grades x 1,500 minutes = 10,500 minutes for each behavior for all grades.

D. 14 behaviors x 10,500 minutes = 147,000 minutes of observation time at all grades for boys and girls. (Assignment completion omitted)

E. 500 minutes of observation time each school day

147,000 ÷ 500 = 294 days

Thus, it would take one trained observer 294 days to collect the required data. This could be done as a district wide effort, or the data could be accumulated over several years as a part of eligibility determination.

Of course, if a school district wished to train all of its special education aides to collect data, the process could be accomplished quickly at essentially no cost. For example, using 20 aides would mean that each aide would have to observe the equivalent of 15 days during the school year.

6. Means and standard deviations could then be developed as descriptors of the local "normal" student population. Referred student data could then be compared to these statistical parameters. In the case of the data such as assignment completion where the standard deviation is inappropriate, cumulative percentages could be obtained. A hypothetical result might look like this:

5th Grade Boys - Assignment Completion

Assignments	Assignments Completed (Boys)	
100%		
90%	95%	Thus, only 1% completed 5% or fewer; while 95% completed 90% of assignments.
80%		
60%	75%	
40%		
20%	15%	
10%	6%	
5%	1%	
0%		